INDOOR AIR QUALITY ASSESSMENT

Massachusetts Rehabilitation Commission
Worcester Branch
340 Main Street
Worcester, Massachusetts

Prepared by:
Massachusetts Department of Public Health
Bureau of Environmental Health
Indoor Air Quality Program
March 2017

Executive Summary

This general indoor air quality (IAQ) assessment was prompted by a referral of an employee complaint. At the time of the assessment, reduction of the number of plants in this office is recommended.

Background

Building:	Massachusetts Rehabilitation Commission (MRC)
Address:	340 Main Street, 5th floor, Worcester, Massachusetts
Assessment Requested by:	Virginia Platt, Project Manager, Division of Capital Asset Management and Maintenance (DCAMM)
Reason for Request:	Follow up/general IAQ concerns
Date of Assessment:	February 3, 2017
Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment:	Michael Feeney, Director, IAQ Program
Building Description:	Multi-story building in downtown Worcester; the MRC is located on the 5th floor.
Building Population:	Approximately 130 employees and visitors from the public
Windows:	Not openable

Methods

Please refer to the IAQ Manual for methods, sampling procedures, and interpretation of results (MDPH, 2015).

Note that this building has been visited by the BEH/IAQ program several times before to address issues relating to particulate infiltration from the ground-floor food service and other IAQ concerns. Reports from these visits are available on the MDPH website at http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/iaq/iaq-rpts/cities-and-towns-w.html.

IAQ Testing Results

The following is a summary of indoor air testing results (Table 1).

- ***Carbon dioxide levels*** were below 800 parts per million (ppm) in all areas assessed, indicating adequate fresh air in the space.
- ***Temperature*** was within or very close to the recommended range of 70°F to 78°F in all areas assessed.
- ***Relative humidity*** was below the recommended range of 40% to 60% in all areas assessed.
- ***Carbon monoxide*** levels were non-detectable in all areas assessed.
- ***Fine particulate matter (PM2.5)*** concentrations measured were below the National Ambient Air Quality Standard (NAAQS) level of 35 micrograms per cubic meter ($\mu g/m^3$) in all areas assessed.

Ventilation

Mechanical ventilation is provided by a series of heating, ventilation and air conditioning (HVAC) air handling units (AHUs) located in closets throughout the floor. Fresh air is drawn through vents located above select window frames. Ductwork connects the AHUs to ceiling-mounted air supply diffusers. By design, air diffusers are equipped with fixed louvers that direct air along the ceiling to flow down the walls and create airflow. Air returns to the AHUs through the fixed louvers in the doors of the AHU closets. A few areas, such as the lounge/kitchen, training rooms and restroom, also have direct-vented exhaust to remove pollutants generated in these areas.

Lack of air exchange/circulation can lead to the build-up of naturally occurring pollutants in the space, which can result in IAQ/comfort complaints. It is recommended that all systems be operated in the “fan on” mode during occupied periods to provide for air circulation. It is also recommended that HVAC systems be re-balanced every five years to ensure adequate air systems function (SMACNA, 1994); it was not known the last time these systems were balanced.

Microbial/Moisture Concerns

Plants were observed in a few areas (Table 1). Plants can be a source of pollen and mold, which can be respiratory irritants to some individuals. Plants should be properly maintained and equipped with drip pans and should be located away from air diffusers to prevent the aerosolization of dirt, pollen, and mold.

Two water-damaged ceiling tiles were observed in an office (Table 1). Water-damaged tiles indicate a leak from plumbing or the building envelope and should be replaced once the source has been repaired.

Water bubblers were directly on carpet. Leaks from these appliances can damage carpeting. Plastic or rubber mats with raised edges should be placed under these items to catch water from spills or leaks.

Conclusions/Recommendations

Based on observations at the time of assessment, the following is recommended:

1. Keep plants in good condition, avoid overwatering, and remove from the airstream of heating and ventilation equipment.
2. Replace water-damaged ceiling tiles after repairing leaks.
3. Operate supply and exhaust ventilation continuously in all areas during occupied periods. Ensure all HVAC equipment is maintained and supply and return vents are cleaned periodically to prevent dust re-aerosolization.
4. Have the HVAC system balanced every 5 years in accordance with SMACNA recommendations (SMACNA, 1994).
5. For buildings in New England, periods of low relative humidity during the winter are often unavoidable. Therefore, scrupulous cleaning practices should be adopted to minimize common indoor air contaminants whose irritant effects can be enhanced when the relative humidity is low. To control for dusts, a high efficiency particulate arrestance (HEPA) filter equipped vacuum cleaner in conjunction with wet wiping of all surfaces is recommended. Avoid the use of feather dusters. Drinking water during the day can help ease some symptoms associated with a dry environment (throat and sinus irritations).

6. Refer to resource manual and other related IAQ documents located on the MDPH's website for further building-wide evaluations and advice on maintaining public buildings. These documents are available at: http://mass.gov/dph/iaq.

References

MDPH. 2015. Massachusetts Department of Public Health. Indoor Air Quality Manual: Chapters I-III. Available at: http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/iaq/iaq-manual/.

SMACNA. 1994. HVAC Systems Commissioning Manual. 1st ed. Sheet Metal and Air Conditioning Contractors' National Association, Inc., Chantilly, VA.

Location: Massachusetts Rehabilitation Commission **Indoor Air Results**

Address: 340 Main St., 5th Floor, Worcester, MA **Table 1** **Date: 2/3/2017**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
Background (outdoors)	421	ND								
Waiting room	572	ND	79	9	1	1	Y	Y	Y	
Hall	576	ND	78	14	1	0	Y	Y	Y	
Breakroom	647	ND	73	13	3	4	N	Y	Y	
002	673	ND	77	14	1	3	Y	Y	Y	
007	510	ND	71	10	14	1	Y	Y	Y	
014	530	ND	73	10	10	2	Y	Y	Y	
017	640	ND	73	13	9	1	Y	Y	Y	
023	616	ND	73	14	6	1	Y	Y	Y	
026	639	ND	74	16	5	2	Y	Y	Y	
034	617	ND	72	15	5	1	Y	Y	Y	
037	573	ND	71	14	4	3	Y	Y	Y	2 water-damaged ceiling tiles

ppm = parts per million µg/m^3 = micrograms per cubic meter ND = non detect

Comfort Guidelines

Carbon Dioxide:	< 800 ppm = preferrable	Temperature:	70 - 78 °F
	> 800 ppm = indicative of ventilation problems	Relative Humidity:	40 - 60%

Location: Massachusetts Rehabilitation Commission **Indoor Air Results**

Address: 340 Main St., 5th Floor, Worcester, MA **Table 1 (continued)** **Date: 2/3/2017**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
038	560	ND	72	13	4	5	Y	Y	Y	
046	536	ND	72	13	6	2	Y	Y	Y	
047	554	ND	73	13	5	3	Y	Y	Y	
060	492	ND	73	12	5	2	Y	Y	Y	
070	613	ND	73	15	5	0	Y	Y	Y	
071	636	ND	73	13	5	6	Y	Y	Y	
075	588	ND	73	13	5	1	Y	Y	Y	
081	653	ND	73	14	7	4	Y	Y	Y	
082	720	ND	73	14	4	2	Y	Y	Y	Plants
085	688	ND	73	15	5	5	Y	Y	Y	
091	668	ND	73	14	3	3	Y	Y	Y	Plants
093	614	ND	73	14	3	3	Y	Y	Y	Plants

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Address: 340 Main St., 5th Floor, Worcester, MA **Table 1 (continued)** **Date: 2/3/2017**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
101	630	ND	73	13	3	1	N	Y	Y	
104	630	ND	72	14	4	2	N	Y	Y	
112	619	ND	73	14	3	0	N	Y	Y	
114	671	ND	73	15	3	1	N	Y	Y	
122	623	ND	73	14	2	1	Y	Y	Y	
127	662	ND	75	13	3	1	Y	Y	Y	
130	628	ND	74	14	2	1	Y	Y	Y	
131	627	ND	74	13	3	3	Y	Y	Y	
137	621	ND	75	13	2	2	Y	Y	Y	Plants
138	622	ND	75	13	3	3	Y	Y	Y	
142	677	ND	74	13	3	0	N	Y	Y	
144	654	ND	75	13	3	1	Y	Y	Y	

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Address: 340 Main St., 5th Floor, Worcester, MA **Table 1 (continued)** **Date: 2/3/2017**

Location	Carbon Dioxide (ppm)	Carbon Monoxide (ppm)	Temp (°F)	Relative Humidity (%)	PM2.5 (µg/m3)	Occupants in Room	Windows Openable	Ventilation		Remarks
								Supply	Exhaust	
149	572	ND	74	13	3	2	Y	Y	Y	Plants

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